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THE *OL[j] CONSTRAINT IN FRENCH

by

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To Dr and Mrs W.D. Gainer

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ABSTRACT

In modern standard French, a consonant sequence obstruent + liquid + yod (*OL[j]), may not occur (O = [p,b,t,d,k,g,f,v] and L = [l,r]). Instead, the vowel [i] occurs following the liquid and a transitional [j] may occur optionally between the [i] and a following vowel resulting in a sequence OL[i]([j])V.

The purpose of this study is to examine the various proposals which have been advanced to account for this constraint, and then to offer a new one within the framework of syllabic phonology.

A survey of the historical data on *OL[j] is then presented. This shows that the sequence was permitted in early modern French (16th century and earlier), and that a consideration of the evolution of French pronunciation can shed some light on the origins of the modern constraint while corroborating in part the proposed analysis and conclusions for the modern French data.

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GLOSSARY OF TERMS, ABBREVIATIONS, AND SYMBOLS

C	:	consonant
cluster	:	a series of consonants belonging to the same syllable
m.c.l.	:	muta cum liquida = OL
NGP	:	Natural Generative Phonology
OL	:	O = [p,b,t,d,k,g,f,v] L = [l,r]
$	:	syllable boundary
sequence	:	a string of consecutive segments irrespective of syllable boundaries
SSC	:	syllable structure condition
V	:	vowel
*	:	indicates impermissible or unattested sound, sequence, word

CHAPTER ONE

1.1 Definition of the constraint.

In modern standard (Parisian) French there exists a phonological constraint which prevents the occurrence of obstruent + liquid + yod sequences or OL[j], where obstruent (O) = [p,b,t,d, k,g,f,v] and liquid (L) = [l,r]. In other words, the third element of a 3-consonant sequence in which the first two elements are OL may not be [j]. Instead of the [j] an [i] occurs following L and preceding a vowel (V), resulting in the sequence OL[i] ([j])V.[1] This can be seen in the following examples:

tablier	[tablije]	ouvrier	[uvrije]
bouclier	[buklije]	meurtrier	[mœrtrije]
oublions	[ublijõ]	rencontriez	[rãkõtrije].[2]

These may be contrasted with L[j] sequences which are permitted in such words as lier [lje], délier [delje], parier [parje]. This is a general constraint which operates across both word boundaries and morpheme boundaries.[3]

There is almost unanimous agreement amongst scholars on the pronunciation of OLi sequences in 20th century French. Before an analysis is presented of the reasons given for this pronunciation, a survey of comments describing the constraint on *OL[j] will be given.

The point of departure for this survey is arbitrarily chosen since the constraint in question was noted in the nineteenth century and earlier (cf. Thurot 1881:I, 286-8).

One of the earliest comments on the constraint in the 20th century is made by Martinon (1913:188) who writes:

> ...la synérèse est impossible, quand l'i est précédé... de l'un des groupes à liquide finale, bl, br, cl, cr, etc.

Fouché (1959) makes the following observations:

> ...i se prononce [i] lorsqu'il est précédé de consonne + liquide (l,r): criard, il plia, etc.
>
> (1959:xxxii; cf. 3-4)

> ...s'il est précédé de consonne + liquide, y se prononce [i] amphitryon, [ɑ̃fitrijõ]...
>
> (1959:xxxiii)

Lombard (1964) presents a comprehensive treatment of *OL[j] and related phenomena in similar environments as part of a monograph dealing with the semivowels and their corresponding vowels in Parisian pronunciation.[4] In particular, he writes the following (Lombard 1964:13):

> (a) Le groupe non admis est 'consonne + [i] ou [r] + [j]': (α) Il y a d'abord le cas où les deux premiers phonèmes sont du type m.c.l.:[5] oublier, ouvrier, etc.; formes verbales comme (nous) mettrions, (vous) mettriez, etc. Tous les mots de ce genre ont [bil], [[illegible]], [tri], etc., avec [i] et non [j]. Le cas de atelier, (nous) appelions est aussi celui de chandelier, chapelier... qui tous font sentir leur [ə], et qui tous, par conséquent, s'opposent à pelletier [pɛltje], époussetions [epystjõ]; [itj] et [stj] sont des groupes courants, contrairement à [tij], [dij], [pij], [vij], [frj], [trj], [drj]. Ces exemples...témoignent tous du souci d'éviter à l'intérieur du mot les groupes [pij], [prj], [bij], etc. On voit donc qu'on évite le groupe [trj], considéré comme trop difficile, en le remplaçant par [trij] dans mettrions [mɛtrijõ], mais par [tərj] dans jetterions [ʒɛtərjõ]:..

Spence (1971:206) and Gertner (1972:14) both make brief references to the constraint on [j] following O + liquid, Gertner's in the form of a generative rule transforming [i] into [j] before a vowel. This rule is stated as follows:

> Preceded by a mute + liquid i becomes [ɪj]:
> tablier [tabɪ'je] 'apron'.[6]
> (Gertner 1972:14)

In a clear, detailed, and well-documented study of modern Parisian pronunciation, Walter (1976) introduces a long list of words containing OL[ɪ] in the following manner:

> On trouvera ci-dessous la liste des mots où l'articulation étudiée est située après consonne + /r/ ou /l/ et où l'unanimité s'est faite pour l'articulation syllabique [ɪj] ou [ɪ].
> (1976:381)[7]

Although Walter does not attempt to account for the OL[j] constraint she provides an invaluable source of pronunciation data.

From the foregoing extracts it can be seen that there is general agreement[8] on the constraint preventing the pronunciation of *OL[j] sequences in French.

1.2 Previous studies concerning the modern French *OL[j] restriction.

Few linguists or grammarians try to account for the restriction on *OL[j] sequences in French, most being content merely to state that such a restriction exists.

Where an attempt is made to account for the restriction it falls into one of two categories, the first being the difficulty of articulating the sequence, and the second being the so-called loi des trois consonnes or règle des trois consonnes.

'Difficulty of articulation' is proposed for *OL[j] by Lombard (1964:12) who talks rather vaguely about 'de nombreux groupes de deux consonnes consécutives après lesquels [j] ne se trouve pas, étant donné que la prononciation est considérée comme trop difficile' (1964:12). He nowhere specifies the nature of the difficulty despite going into considerable detail on the different environments in which difficulties like this arise. In this section of the monograph Lombard concentrates on the 'problème de la concurrence entre [l] et [j]' (1964:16) and does not suggest that the difficulty might be accounted for by considering the nature of the surrounding segments.

'Difficulty of articulation' is also hinted at by Rosset (1911:202) when he describes the 3 syllable pronunciation of meurtrier as 'une nécessité phonétique.'

Rosset's hint and Lombard's vagueness both seem to refer to articulatory and perhaps perceptual difficulties. Neither author describes or defines the necessity (in the case of Rosset) or the difficulty (in the case of Lombard), so we are left to speculate somewhat on the exact meaning of their statements. They certainly do not reach the point of investigating the reasons for the OL[j] constraint. It is not sufficient to advance 'difficulty' as a reason for any constraint without defining what is meant by the term. In the case of both Rosset and Lombard, therefore, the 'explanation' is inadequate.

The loi des trois consonnes 'explanation' for the *OL[j] restriction is advanced by Delattre (1951:66):

> La loi des trois consonnes - qui veut que l'on évite de prononcer trois consonnes ensemble dans la même syllabe - s'applique aux semi-voyelles pour leur rendre leur timbre vocalique quand elles sont précédées de plus d'une consonne...

pied	[pje]	prier	[pri-je]
papier	[pa-pje]	peuplier	[pœ-pli-je]
vendiez	[vã-dje]	vendriez	[vã-dri-je]
répondiez	[re-põ-dje]	répondriez	[re-põ-dri-je]
pion	[pjõ]	plions	[pli-jõ]
bière	[bjɛr]	sablière	[sa-bli-jɛr]
courions	[ku-rjõ]	couvrions	[ku-vri-jõ]
dernier	[dɛr-nje]	ouvrier	[u-vri-je]
diable	[djabl]	oublia	[u-bli-ja]
portier	[pɔr-tje]	meurtrier	[mœr-tri-je]

This comment comes from a handbook of French pronunciation for North American students and could therefore be excused for being an oversimplification of the *OL[j] situation if the simplification were founded on the facts of French phonology. However, this is not the case. Delattre's use of the 'loi des trois consonnes' to account for the *OL[j] constraint is inappropriate and misleading because the 'loi' itself is an invalid principle for French, as I will now demonstrate.

The original formulation of the 'loi des trois consonnes' is expressed in the following two extracts from Grammont 1894:

> L'-e-, étymologique ou non, n'apparaît que lorsqu'il est nécessaire pour éviter la recontre de trois consonnes comprises entre deux voyelles fermes.[9] (53)

> Lorsqu'il y a trois consonnes entre deux voyelles fermes, il reste (ou il s'intercale) un -ė- entre les deux premières et après l'-e-.[10] (57)

The analysis which Grammont presents in this study on the occurrence and non-occurrence of e caduc attempts to account for an enormous number of exceptions to the 'loi'.[11] These exceptions demonstrate the fundamental flaw in Grammont's principle; there is no general constraint in French preventing more than two consonants from occurring in sequence. A brief survey of the French lexicon illustrates this fact clearly. Three-consonant sequences occur in words such as scrupules [skr-], interprête [-rpr-], and four consonants occur together, for example, in exprès [-kspr-], construire [-stry-], abstrait [-pstr-]. The list could be added to at length especially when sequences occurring across word boundaries are included, e.g., chaque violon [-kvj-], tu parles bien [-rlbj-].

Even if we restrict our view to sequences containing OL + semivowel we find that there is no single principle which applies to all three semivowels in order to prevent them from forming three-consonant sequences. As we have already seen, *OL[j] is, indeed generally constrained, but OL[w] sequences occur where the vowel following [w] is /a/, as in trois [trwa], froid [frwa] or gloire [glwar] (cf. Lombard 1964:31), and also where a sequence is formed across a word boundary, as in but louable [-tlw-], Jacques louait [-klw-], or toute loi [-tlw-], (cf. Lombard 1964: 6). The same applies to OL[ɥ] sequences which occur before an /i/, as in pluie [plɥi], bruit [brɥi] or fruit [frɥi] (cf. Lombard 1964:25), and also across word boundaries, as in cette lueur [tlɥ-].[12]

Pulgram (1961:309-310) makes use of this kind of data and comments as follows in his analysis of the 'loi des trois consonnes':

> Unsuitable though the criteria may be in the light of modern linguistics, the resultant rule, if restated in terms of phonemic distribution, would be acceptable - if only the facts were correct; but they are not... ...it makes little sense, and is phonemically improper, to propose two different descriptions, or prescriptions, of consonantal clustering, one where /ə/ is involved, and another where it is not. A language either does or does not show a given phonemic distribution; ...

Continuing from this passage, Pulgram analyzes the attempt made by Weinrich (1958) to revise the 'loi des trois consonnes'. One example from Pulgram's analysis will serve to illustrate the point raised in the quotation above concerning phonemic distribution. It will also show the kinds of flaws which remain in the 'loi des trois consonnes' even after considerable revision. Pulgram (1961:312) points out that Weinrich notices an optional pronunciation of the phrase avant de se fâcher [avãdsfaʃe] which contains the 'cluster' (Pulgram's term; described by Weinrich as 'Dreiergruppe' 1958:254) [dsf] and a 'subcluster'[sf]. Of this 'subcluster'[sf] Weinrich says:

> Nun gibt es die Gruppe sf- im Anlaut nur in dem recht seltenen Wort sphère. Das ist aber für das Drei-Konsonant-Gesetz ohne Belang, weil es dafür im Französischen um so mehr Wörter gibt, die im Anlaut s mit einem stimmlosen Verschlußlaut kombinieren. Hier kommt es also auf die ganze Klasse s + Konsonant an [including [ʃ]+ [ʒ]. Auch wenn innerhalb dieser Klasse einzelne Stellen eine sehr geringe funktionale Belastung haben, ist der Charakter der ganzen Klasse für die Kombinatorik maßgeblich.
>
> (1958:294-5)

Pulgram challenges this solution to the difficulty posed by [sf] by saying that it 'is unsatisfactory reasoning for the acceptance of /sf/: it is scarcely legitimate, in order to make a case for the equality of /s/ plus voiceless stop and /s/ plus /f/, to classify both voiceless stop and /f/ under the title consonant, unless it is proven, as it is not because it cannot be, that in the French phonemic structure /f/ behaves like a voiceless stop.' (1961:313) This comment, along with several others, illustrates the inappropriateness of a three-consonant sequence constraint as a general principle for French. This means that the 'loi des trois consonnes' and its successors have no place in French phonology. As Barker (1924/5:278) claims, 'there is no règle des trois consonnes that has any validity', so studies such as Pernot 1929/30:78ff, Nyrop 1934: 66-72, Delattre 1951:66, Malécot 1955/56:47-49, and Sten 1956: 32,40, which rely in whole or in part on the 'loi' are seriously compromised if not completely invalidated.

The implications of the removal of the 'loi des trois consonnes' are obvious; one cannot account for the *OL[j] constraint using the 'loi'. Delattre (1951:66) in particular is a completely inadequate account despite the accuracy of the pronunciation data offered as evidence. Lombard (1964:6) uses the 'loi' only briefly for illustrative purposes and his reference to it does not affect his study of the semivowels in any noticeable way. Nonetheless, no valid reason for the constraint is given by either Delattre or Lombard.

Although the 'loi des trois consonnes' fails to account for the constraint on *OL[j] sequences, the attempt to indicate acceptable consonant sequencing in French seems to point towards a solution which is based on segment combination.

One of the more recent attempts in this direction is that proposed by Pulgram 1970. Arguing forcefully for the universality of the syllable, Pulgram develops a theory of syllabification which concentrates heavily on establishing syllable boundaries. He states that 'the definition of the syllable in any language is...a statement about syllabic boundaries exclusively...'[13] (1970:23).

The way in which Pulgram sets about locating syllable boundaries is to examine the distribution of the segments occurring at the beginning and the end (or 'terminals') of words or longer utterances. The combinations found at the terminals of the words and phrases of a language he then equates to the combinations found in syllable-terminal position. This equation is expressed in the 'Principle of Identity of Word-Terminal and Syllable-Terminal Phonotactics' (1970:47).

This principle is founded on the assumption that word-initial and word-final clustering phenomena can be used to predict clustering syllable-initally and syllable-finally not only for syllables in word-terminal position but also for those in word-medial position.

On the surface, this assumption seems quite reasonable. In fact Bell 1976a, in his discussion of the so-called 'Kuryłowicz Condition' (a principle which is basically the same as Pulgram's

'Principle of Identity' - not surprisingly, since Pulgram's is indirectly based upon it), notes that 'compared to most sweeping statements about the syllable, the condition's conformity with the 'phonetic facts' is astonishingly general' (1976a:255). This applies also to Pulgram's principle. However, in practice, the facts of language-specific pronunciation present problems for Pulgram's theory.

In French an initial [rj] cluster may occur in words such as rien [rjɛ̃] and rieur [rjœr]. This being so, the 'Principle of Identity' allows a syllable division to be made at any point within a word or phrase before a sequence of [r] + [j]. In theory, it therefore allows an OL[j] sequence to occur as long as the syllable boundary is placed between O and L - O$L[j]. Pulgram 1961 illustrates this with an example taken from Weinrich (1958: 258) in which it is stated that the two forms nous fonderions and nous fondrions can only be pronounced [nufõdərjõ] and [nufõdrijõ]. Pulgram disagrees with this by saying that he can allow a pronunciation [nufõdrjõ] by making the syllable division between the [d] and the [rj] ([nu$fõd$rjõ]) 'with syllable initial /rj/, for both phrases, and they are indeed often pronounced thus homophonously' (1961:318). However, Pulgram presents no evidence to indicate that either of these forms is pronounced in this way. On the contrary, there is a substantial amount of counter-evidence. No matter where a syllable boundary is placed, no O[rj] cluster or sequence is possible word-medially in French (cf. Lyche 1979:326-7; Gaatone 1976:334 note 10; Walter 1976:318f., amongst the most recent).

Pulgram is trying to claim that because [rj] is permissible in absolute initial position there is no reason why, word-medially, it cannot occur even when preceded immediately by a consonant (as in prendrions, fondrions) as long as the syllable division is made in the right place.

There is a problem with Pulgram's theory which is illustrated clearly by this claim; it permits a sequence which does not occur in French, i.e. *OL[j]. This is a fairly fundamental flaw in the theory, to which must be added the criticisms levelled by Bell at the notion of the distributional syllable, in particular with respect to 'syllabicity', i.e. the problem of distinguishing syllable nucleus from syllable margin (Bell 1977:250), and also to 'syllabification', i.e. the problem of establishing syllable divisions (Bell 1977:254). After a comparison of a number of distributional approaches which for the most part predate Pulgram 1970,[14] Bell reaches the following conclusion:

> The specific theories of the distributional syllable that have been proposed are unsuccessful. They are unsuccessful because their implicit or explicit conceptual bases... are stretched too far. These principles thus should not be adopted as a basis for language description, as has happened. This practice is not harmless. It robs the linguistic community of whatever empirical observations about syllabic phenomena that might have been made independently of these assumptions.
>
> (1976a:260)

With the failure of the distributional approach to syllabic phonology to provide even a description of, much less to account

for the *OL[j] constraint, another solution must be sought.[15] A more recent theory, which is based on syllable structure phenomena but which does not rely on segment distribution as heavily as that proposed by Pulgram, forms the basis of the discussion in the next chapter.

FOOTNOTES

1 The semivowel [j] is optional in this sequence; cf. Fouché 1959:xxxii and Warnant 1964:xi. This [j] is a transitional glide between two vowels which operates to prevent hiatus. As such it is of a completely different nature than the [j] which is being discussed in this study.

2 These pronunciations are found in Warnant 1964 (without a [j]; cf. footnote 1) and in Martinet and Walter 1973.

3 There are a small number of exceptions to the *OL[j] constraint which will be discussed individually in chapter 2.

4 See Straka 1964 for a discussion on the use (or misuse) of the terms 'semivowel' and 'semiconsonant'. See also Malmberg 1972:84, footnote 2. Pages 3-24 in Lombard 1964 are relevant to this study and, in particular, pages 11-24 deal with [i] and [j].

5 The abbreviation m.c.l. stands for 'muta cum liquida', which is for all intents and purposes the same as O + L. See Lombard 1964:9 for the inclusion of [f] and [v] in the category of 'mutae'.

6 Standard generative notation for this rule is as follows: i → ij/C_X where C = consonant and X = any vowel except schwa. (Gertner 1972:17).

7 After listing more than 200 words as evidence for this statement, Walter concludes:

> Dans cette position, c'est-à-dire après consonne + /l/ ou /r/, c'est toujours l'articulation syllabique qui se réalise à l'unanimité l'archiphonème prenant le plus souvent la forme [ij]...
>
> (1976:383)

8 Two studies which appear to call into question the general applicability of the constraint are Juilland 1965 and Klausenburger 1970. An initial check of Juilland's Dictionnaire Inverse (usually an invaluable source of data) reveals, on pages 83, 84, 86, and 87, 29 examples of OL[je] which seem to be erroneous particularly since there are 25 items on page 82 for which he gives OL[ij] as the pronunciation. Given the lack of explanation, the randomness of these exceptions, and the abundance of counter-evidence from Warnant 1964 and Martinet and Walter 1973 amongst others, these 'exceptions' can be disregarded as erroneous, as pointed out by Gaatone (1976:334).

Klausenburger suggests that modern French contains several 'three-member post-pausal clusters' (1970:67) of which one such type is a two-member cluster plus /j/:

/prj/ prière
/trj/ trier
/krj/ crier
/brj/ brièvement
/grj/ grièvement
/klj/ client

It must be assumed, as for Juilland (1970:68), that this is also an erroneous listing. Rochet (1975) notes this listing with the following comment: 'In the list of occurring three-member postpausal clusters, one is surprised to find two-member plus [j] clusters...To my knowledge, these words are all uttered with two syllables where K. posits one: not *[prjɛr] but [pri-(j)ɛr], etc.' (1975:25) Rochet gives a footnote reference to Warnant 1964.

9 Original emphasis. Grammont defines 'voyelles fermées' as 'toutes celles qui ne sont pas susceptibles de tomber par l'effet de cette loi...' (1894:53, fn.), i.e., every vowel except e caduc itself.

10 On the next page Grammont states that 'le principal intérêt de ce traitement porte sur la coupe des syllabes...' a comment which, seemingly, is ignored by Martinon (1913:115-8) and neglected by Grammont himself despite the comment just quoted. Cf. 1930:105-120.

11 Cf. Pulgram 1961:310-11: 'Grammont's text is, in any event, riddled with subrules and exceptions, and requires (in the 1946 printing) thirteen pages of explicating. Hence there is not really much of a workable rule left' (310).

12 Delattre (1951:66) himself gives examples of OL[w] and OL[y]: proie, trois, droit, crois, cloître, froid, gloire; pluie, bruit, fruit, truite. Reinheimer-Rîpeanu (1976:473) also gives several examples of each.

13 For a criticism of this point see the review of Pulgram by Bell (1976:242).

14 Arnold 1955/56 presents one such approach. He proposes a theory for French phonology based on statistical data which indicate the frequency of occurrence of all the phonemes of French in each of 4 positions in the syllable; initial, post-initial, pre-final, final. From the results, Arnold formulates his theory indicating combinability of consonants and position of syllable boundaries.

The first, and most obvious, difficulty with the analysis with regard to OL[j] is the fact that, in syllable-initial position, [lj] and [rj] are not permissible according to Arnold. On page 275 the two-term consonant combinations are outlined for this position:

> Each combination contains a normal <u>initial</u> either preceded by a pre-initial /s/ or followed by a post-initial /l/, /r/ or /j/.
>
> | Pre-initial | Normal Initial | Post-initial |
> |---|---|---|
> | /s/ before /p r t/ | All consonants except /n z ʒ/ | /r/ follows /p b f/ /k g/ /t d v/ |
> | | | /l/ follows /p b f/ /k g/ |
> | | | /j/ follows /p b f/ /t d v/ /(s)/ |
>
> (Arnold 1955/56:275)

There are a number of examples which demonstrate that L/j/ occurs as a syllable-initial sequence; e.g., <u>lien</u>, <u>lierre</u>, <u>lion</u>, <u>rien</u>. This pinpoints a specific lack of the theory; there is no real check made of the distribution of consonant clusters or sequences. Actual occurrences of clusters such as /lj/ and /rj/ must be accounted for; it is of little value to propose a set of clustering or sequence constraints when an examination of the lexicon of French reveals numerous counter-examples.

15 Transformational/generative theories of grammar are of little use at this point. Transformational-type phonology is generally not formulated to accommodate the syllable as a fundamental unit. In such theories, the syllable is not regarded as a unit which may influence or condition the behaviour of the sounds of a language. As will become apparent in the next chapter, the position of sounds relative to the shape of the syllable can be a significant determinant of their phonetic behaviour in combination with neighbouring sounds.

It seems then that a different approach must be taken in order to account for the *OL[j] constraint.

CHAPTER TWO

2.1 Proposal for *OL[j] constraint.

Pulgram's theory of syllabification belongs to the category of those which, according to Bell and Hooper (1978:4), assume 'that segments fixed in sequence are given' and that syllable boundaries are placed 'around words and among the segments of words'. Another category of theories includes those which do not insert boundaries into sequences of existing segments and words, but rather view the syllable structure as basic and the sequencing of segments as predictable from this basic structure (cf. Bell and Hooper; loc. cit.).

Bell and Hooper (1978:6) also state that 'the strongest hypothesis about a descriptive theory [of syllabification] is...that no language-particular statements are necessary.' They go on to say that two principal characteristics of the syllable have been used to implement this hypothesis: the first, the 'striking similarity of word-medial consonant sequences and combinations of word-final and word-initial clusters' (Bell and Hooper; loc. cit.), forms the basis of a number of theories including the 'distributional' theories of which Pulgram 1970 is one example. As Bell and Hooper point out, such theories, which exclude language-specific statements unless based on this similarity of distribution, are unsuccessful 'when applied beyond phonotactic criteria' because 'in giving interior sequences a derivative status, they do not incorporate any hypothesis about substance that holds for both interior and exterior sequences' (Bell and Hooper 1978:6).

The second principal characteristic of the syllable is that the sequence of segments within the syllable depends on 'an inherent hierarchical scale of sonority or strength which can be independently determined by their universal phonological properties, or...by a combination of universal and specific ones' (Bell and Hooper 1978:6). This has been labelled the 'sonority hypothesis' by Bell and Hooper who define it as follows:

> Segments of a syllable must be arranged in such a way that their sonority increases from the onset to the nuclear peak and decreases thereafter.
>
> (1978:11)

The theory of Natural Generative Phonology[1] (NGP) as Hooper (1976) presents it is based on this principle, which is fundamentally different from that upon which distributional theories such as Pulgram's are founded. Hooper (1976) argues that the inherent properties of segments must be taken as fundamental in determining syllabification since sequence constraints are generally the same whether their domain of application is across a syllable boundary within a word or across a word boundary (cf. Bell and Hooper 1978:6). Since Pulgram's theory has already been demonstrated in the previous chapter to be inadequate in accounting for the *OL[j] constraint in French, it seems that NGP, being founded upon the notion of an independently motivated syllable, may prove more successful in this regard.

NGP takes the phonological rules from transformational generative theory and divides them into three types; phonological, morphophonemic, and via-rules (Hooper 1976:84). Within the first type (phonological rules) is included a set of syllable structure conditions. These conditions are embodied in the 'universal

condition on preferred syllable structure' (SSC), the general form of which is given by Hooper (1976:229) as follows:

Universal condition on preferred syllable structure:

P(C): $\$C_m C_n C_p C_q VC_r C_s C_t \$$

where $m > n > p > q$

$r < s < t$ [corrected from Jensen 1978]

$m > t$

$m \neq \emptyset$

> ...The condition states that the SSC for any given language has a uniform shape: The C's are on the margins, and an obligatory V (or [+ syllabic] segment) makes up the nucleus. The strength scale values for the various C positions should descend from syllable-initial position inward toward the nucleus and also descend from syllable-final position inward toward the nucleus.
>
> The condition $m > t$ means...the strongest C in syllable-initial position must be stronger than the strongest C permitted in syllable-final position...The condition $m \neq \emptyset$ means that a given language may not have an SSC that does not permit CV syllables.

As we can see from the foregoing explanation, the operation of the SSC in a language depends upon a scale or hierarchy of consonantal strength (as was indicated above by Bell and Hooper). In proposing that syllabification rules be stated in terms of consonantal strength, Hooper is following, amongst others, Vennemann (1972) who sees the organization of segments in a language in terms of a 'partly universal, partly language-specific relational hierarchy' (1972:7).[2]

In her discussion of strength relations, Hooper indicates a preference for treating syllabification in terms of strength rather than distinctive features of segments for the following reason:

> ...by correlating a cover feature strength of consonants with the strength of syllable position, we can develop an explanation for phonotactic constraints or segments, provided, of course, that the strength hierarchy can be independently motivated.
>
> (1976:197)

As evidence of such independent motivation, Hooper mentions, amongst other phenomena, the process of 'strengthening' which she maintains always occurs in syllable-initial position and never in syllable-final or second position (1976:199); assimilation, which occurs more readily at the end of a syllable than at the beginning (1976:200-201); and the number of contrasts possible between consonants in various positions in the syllable, most contrasts occurring in syllable-initial position, and fewer occurring elsewhere (1976:200). Hooper also quotes the example of historical sound shifts outlined by Foley (1970) who notes the Spanish consonant shift in which long (voiceless) consonants became short, short (voiceless) consonants became voiced, voiced consonants became continuants, and some continuants disappeared (Hooper 1976:202-203; Foley 1970:87-8). Both Hooper and Foley see this shift as a process of consonantal weakening which both consider to be independent evidence for strength relations as basic elements of a phonological system.

The explanatory value of Hooper's view of the structure of syllables (as expressed by the SSC) is suggested by earlier linguists, amongst whom Hooper (1976:197-8, 201) notes Jespersen and Saussure. Jespersen (1913) presents a theory of syllabification based on a scale of sonority of segments. In this theory the segments which occur at the peaks of sonority in the sequence

form the syllable nuclei. Jespersen's conception of sonority ('Klangfülle') which was formulated as early as 1889, is summarized as follows:

> ...die Klangfülle in direkten Verhältnis zu der Grösse des Raumes steht, den die schwingende Luft zu passieren hat.
>
> (1913:190)

He goes on to present a scale of sonority which has 8 degrees:

1a	voiceless stops	[p t k]
1b	voiceless fricatives	[f s ç x]
2	voiced stops	[b d g]
3	voiced fricatives	[v z ɣ]
4a	voiced nasals	[m n ŋ]
4b	voiced lateral	[l]
5	voiced r-sounds	
6	high vowels	[y u ɪ]
7	mid vowels (mittelhohe)	[ø o e]
8	low vowels	[ɔ œ a]

(based on 1913:191)

If a series of sounds is analyzed in terms of the differences in sonority between them the division into syllables is effected in this manner:

> in jeder Lautgruppe gibt es ebensoviele Silben als es deutliche relative Höhepunkte in der Schallfülle gibt.
>
> (1913:193)

The 'Höhepunkte' referred to in this passage are peaks of sonority, usually vowels, and are so called because Jespersen uses a graph-like scale to analyze his examples. This scale is numbered from bottom to top starting from 1, the voiceless stops, and finishing at 8, the low vowels.

Saussure (1955[1915]) proposes a similar theory based on a scale of degrees of aperture:

Aperture 0: Occlusives [p b (m) t d (n) k g (ń)]
Aperture 1: Fricatives ou spirantes [f v Φ ð s z š ž x ɣ x'ɣ']
Aperture 2: Nasals [m n ń]
Aperture 3: Liquides [l l' ɾ r]
Aperture 4: [i u ü] (plus nasal equivalents)
Aperture 5: [e o ö] (plus nasal equivalents)
Aperture 6: [a] (plus nasal equivalents)

(1955[1915]:71-76)

The sounds with the greatest degree of aperture in a sequence represent the syllable nuclei in much the same way as the most sonorous segments do in Jespersen's theory.

Hooper's approach to a hierarchy of consonantal strength is basically the same as these and other previous attempts to establish a relational hierarchy of segments. She cautions that although the term 'strength' refers to physical attributes or characteristics of consonants, there is no absolute correlation between these attributes and 'strength' of the syllable. After noting the failure of all attempts to establish such an absolute correlation, Hooper says:

> I am viewing the syllable, and for that matter the cover feature strength, as theoretical constructs, not entirely divorced from physical reality, but abstract in that their importance is seen only in their function in a linguistic system.
>
> (1976:198)

She then describes the shape of the syllable in terms of the relationship between the margins and the nucleus. The structure of the hypothetical syllable is given as follows:

MARGIN			NUCLEUS			MARGIN		
Obstruents	nasals	liquids	glides	vowels	glides	liquids	nasals	obstruents
Least vowel-like			Most vowel-like			less vowel-like		
STRONG			WEAK			WEAK		

(1976:199)

Using this hypothetical structure as a base, Hooper examines independent phonological evidence for a strength hierarchy from a number of different languages, and after a comparison of this evidence she proposes the following strength hierarchy for consonants which she describes as universal although not absolute (cf. 1976:205).

glides	liquids	nasals	voiced continuant	voiceless-continuant voiced-stop	voiceless stop
1	2	3	4	5	6

(1976:206)

According to this hierarchy, glides (1) are the weakest consonants and voiceless stops (6) are the strongest.

On the basis of the sonority hypothesis, Hooper's hierarchy can also be read with the glides (1) as the most sonorous consonants and the voiceless stops (6) as the least sonorous.

If we consider the *OL[j] constraint in terms of the strength hierarchy or the sonority hypothesis we can see that the segments which constitute the constrained sequence occur in decreasing order of strength or increasing sonority; obstruent--liquid -- glide. They should therefore be possible as a syllable-initial cluster. However, this cluster is not permitted in French so a question is raised concerning the validity of Hooper's hierarchy; it seems that NGP cannot explain the *OL[j] constraint.

Although it is true that a simple insertion of [l] and [r] into the category 'liquids' and [j] into the category 'glides' will result in an incorrect output, NGP does contain the flexi-

bility required to accommodate the *OL[j] constraint, at least in principle. One important feature of the theory is that the strength hierarchy may be altered for specific languages. Hooper says that 'there are language-specific strength relations that may violate these universal tendencies in minor ways...'(1976:205-6). Vennemann makes a similar comment when he says that it is likely that 'the precise organization of the strength hierarchies is language-specific' (1972:11).

Since the SSC cannot account for the *OL[j] constraint on the basis of the universal hierarchy given by Hooper, it is possible that there is a language-specific hierarchy for French which can accommodate and account for it. A focus of this kind at the level of a particular language is advocated, and in fact required, by Bell and Hooper (1978) who offer this cautionary remark on the sonority hypothesis:

> One aspect that needs further elaboration is the basis for sonority ranking of segments. One cannot operate successfully with general categories such as obstruent, nasal, liquid and glide without knowing more of the details of the phonetic realization and phonological properties of the particular segment in the particular language. [3]
>
> (1978:12)

Hooper herself refers to variations from the universal hierarchy (in terms of violations of universal tendencies) when she says that she would expect that 'phonetic explanations for such violations can be found' (1976:206). Thus, according to both Hooper (1976) and Bell and Hooper (1978), some kind of phonetic or phonological parameter needs to be found which will help place individual segments within a relational hierarchy for a particular

language.

One such parameter for the consonants of French is provided by Delattre (1940) who offers some tentative guidelines for establishing syllable boundaries. Working with intervocalic groups of two consonants, Delattre (1940:582) establishes syllabic divisions on the basis of the 'tension croissante' or 'décroissante' of the first consonant of each group. If it has 'tension croissante' the division is made between the preceding vowel and the first consonant (e.g. a-pprend), but if it has 'tension décroissante' the division is made between the two consonants (e.g. ar-pent). Delattre explains that when a consonant 'est à tension croissante' it is this consonant which attracts the greater amount of articulatory energy. The articulatory effort required is never the same for both consonants. On this basis, Delattre formulates the two following principles:

> Si l'effort articulatoire dominant se porte sur la première consonne, c'est qu'elle a une tension croissante et que la coupe syllabique se fait avant les deux consonnes.
> Si, au contraire, l'effort articulatoire dominant va à la deuxième consonne, c'est que la première a une tension décroissante et que la coupe syllabique se fait entre les deux consonnes.
>
> (1940:582)

The 'effort articulatoire' is defined in part by the 'force d'articulation' which Delattre includes within the framework of a set of six principles of 'syllabation phonétique' (1940:583-7).[4]

The 'force d'articulation' (hereafter force of articulation) is described by Delattre (1941) in a study based on the results of an experiment which measured the duration of the

vowel immediately preceding the consonant or pair of consonants for which the force of articulation was to be determined. Delattre (1941:222) describes the experiment in the following terms:

> Au cours de notre étude de quantité vocalique, nous avions établi que la durée des voyelles E était inverse de la force d'articulation des consonnes subséquentes et que c'était par anticipation d'un plus ou moins grand effort articulatoire consonantique que la voyelle s'abrégeait ou s'allongeait. Si les principes qui résultaient de nos travaux sont justes, nous avons, dans la classification des durées vocaliques devant consonnes, une classification, en sens inverse de la force d'articulation des consonnes.[5]

Delattre also notes that the experimental conditions were controlled so that 'les consonnes étaient toutes après la même voyelle (E) et finales de syllabes accentuées fermées terminant des groupes rythmiques de longueur presque égale' (1941:222).

The mean values of vocalic duration obtained from five repetitions of the experiment range from 42.8 to 11.6 hundredths of a second. Delattre then inverts this range of values to form a conventional scale of 0 to 100 where 0 represents the weakest and 100 represents the strongest force of articulation. For single consonant force of articulation the following figures are given:

[p t k]	95	[b d g]	53
[f]	80	[ɲ]	47
[l]	70	[j]	38
[n]	62.5	[v]	22.5
[s]	62	[ʒ]	15
[m]	55.5	[z]	14
[ʃ]	55	[r]	0

(1941:223)

The value 95 for [p,t,k], for example, corresponds to actual vowel durations of 14, 15, and 16 hundredths of a specond, while 0 for [r] corresponds to a duration of 42 hundredths of a second (1940:585, footnote 12).

These results show a relative difference in force of articulation between [l] and [r] which is surprising in view of the fact that most classifications of consonants, whether in terms of sonority (Jespersen 1913), degree of aperture (Saussure 1955[1915]; Grammont 1930 [cf. Delattre 1940:584]), or strength (Vennemann 1972; Hooper 1976), place both of these sounds close together, usually under the same category of 'liquids'. Delattre's figures suggest that this classification does not apply in French. They also provide experimental data which can be used to support a modification to Hooper's 'universal' strength hierarchy.

There is sufficient distance between [l], [j] and [r] on the force of articulation scale to support the following rearrangement of the weak end of the strength hierarchy:[6]

[r]	[j]	[l]	nasals	voiced continuant	voiceless cont. voiced stop	voiceless stop
1	2	3	4	5	6	7

This rearrangement prevents the occurrence of syllable-initial [rj] and O[rj] sequences in French.

Some of the most common examples used to illustrate the occurrence of the *OL[j] constraint also serve to demonstrate the operation of the revised hierarchy on *O[rj] sequences according to NGP principles: crier [krije], février [fevrije],

grief [grijɛf], huître [ɥitrije], lévrier [levrije], marbrier [marbrije], meurtrier [mœrtrije], ouvrier [uvrije], prier [prije], quatrième [katrijɛm], trier [trije]. These words are all syllabified in the following manner: [kri$je], [fe$vri$je], [gri$jɛf], [ɥitrije], [levrije], [marbrije], [mœrtrije], [uvrije] [pri$je] [ka$tri$jɛm] [tri$je]. Words such as février, huître, lévrier, marbrier, meurtrier, ouvrier, and quatrième, in which the OL sequence is word-internal, may not contain a syllable boundary following the OL sequence (as, for example, *[fevr$i$je], *ɥitr$i$je], *[levr$i$je], etc.) because the SSC requires the segments of a syllable to increase in strength towards the syllable margins. Insertion of a syllable boundary following OL violates this requirement.

Nor may these words contain a syllable boundary between the obstruent and the liquid (as, for example, *[marbrije], *mœrtrije], *[uvrije], etc.) despite their fulfilling the requirement that the segments must increase in strength towards the margin. This analysis is prevented by the action of another constraint on syllable structure in addition to the SSC. This constraint affects syllable-initial strength and is explained by Hooper (1976:220) as follows:

> A further condition must be imposed on the syllable structure condition in order to ensure proper assignment of syllable boundaries...This condition requires that a syllable-initial C be stronger than the immediately preceding syllable-final C:
> (12) If XVC$C V, and there is no pause between C_r and C_m, then m>r.

Although the condition is formulated to accommodate Spanish data in this instance, the constraint also applies to French and reflects the universal tendency for syllable-initial position to be the strongest position in the syllable (cf. Hooper 1976:199 and above p. 19). In the examples above of non-permissible syllable division between 0 and L, the condition m>r is violated because there is no pause between 0 and L, and 0 (r) is stronger than L (m).

One sequence which occurs in French, namely syllable-initial [rj], violates the syllable structure condition by reversing the order of strength expected according to the proposed hierarchy for French consonants. This sequence occurs in rien [rjɛ̃] (cf. Martinet and Walter 1973; Warnant 1964), but there is some disagreement on its occurrence in other words. Warnant (1964) allows it, for example, in riant [rjɑ̃] and rieur [rj œ r] as well, but Martinet and Walter (1973) do not, giving [r|jɑ̃nt] (riante) and [r|j œ r]. (In fact the only /$rj/ which they allow is in [rjɛ̃].) To test this out, rien, rioter, rions, rieur(-se) were included in dialogues recorded by nine native speakers of French.[7] The following results were obtained: from 18 repetitions of rien, 10 were [rjɛ̃], 7 were [r|jɛ̃] and one was doubtful; of 18 repetitions of rioter, 16 were [r|jote], one [rjote], and one doubtful; of 9 repetitions of rions (1st pers. pl. imperative), all 9 were [r|jõ]; of 9 repetitions each of rieur and rieuse, all 9 were [r|j œ r]/ [r|j œ z]. This clearly shows the exceptional position of [rj] word-initially.

Normally a sequence [rj] would be syllabified [r$j] according to the NGP analysis using the modified consonantal strength hierarchy. This syllabification is supported by evidence gathered on the basis of the 'loi de position'. The 'loi' states that a higher mid-vowel ([e]) indicates a free syllable, and a lower mid-vowel ([ɛ]) indicates a checked syllable. The application of this principle to standard French is generally considered to be inconsistent. However a number of examples indicate its application with respect to [rj] sequences, supporting the placement of a syllable boundary between [r] and [j] and confirming the proposed account of the *OL[j] constraint on the basis of a modified strength hierarchy. Malmberg (1972:44) gives [dɛrjɛ:r] derrière as an example of an [ɛ] in a checked syllable commenting that 'devant l'accent, on a, comme en position tonique, toujours /ɛ/ en syllabe fermée'. Fischer (1980:26) notes the pronunciation [sɛrjø] sérieux. Results obtained from my informants show that [ɛ] is pronounced without exception preceding [rj] and also word-medially. The words derrière, férié, gériatrique, inférieur, intérieur, sérieux and supérieur, and a group of less common words chériat, mérièdre, périanthe, périèque, were pronounced by all nine informants invariably with an [ɛ] before [rj].[8]

Where a word such as rien [rjɛ̃] occurs at the beginning of a phrase and the [rj] sequence is therefore in absolute-initial position, the [r] is strengthened in order to enable it to be pronounced before the [j] in a syllable-initial sequence $[rj]. The strengthening or reinforcement of [r] in this environment is confirmed by an acoustic comparison of initial [rj] with phrase-

internal [rj].

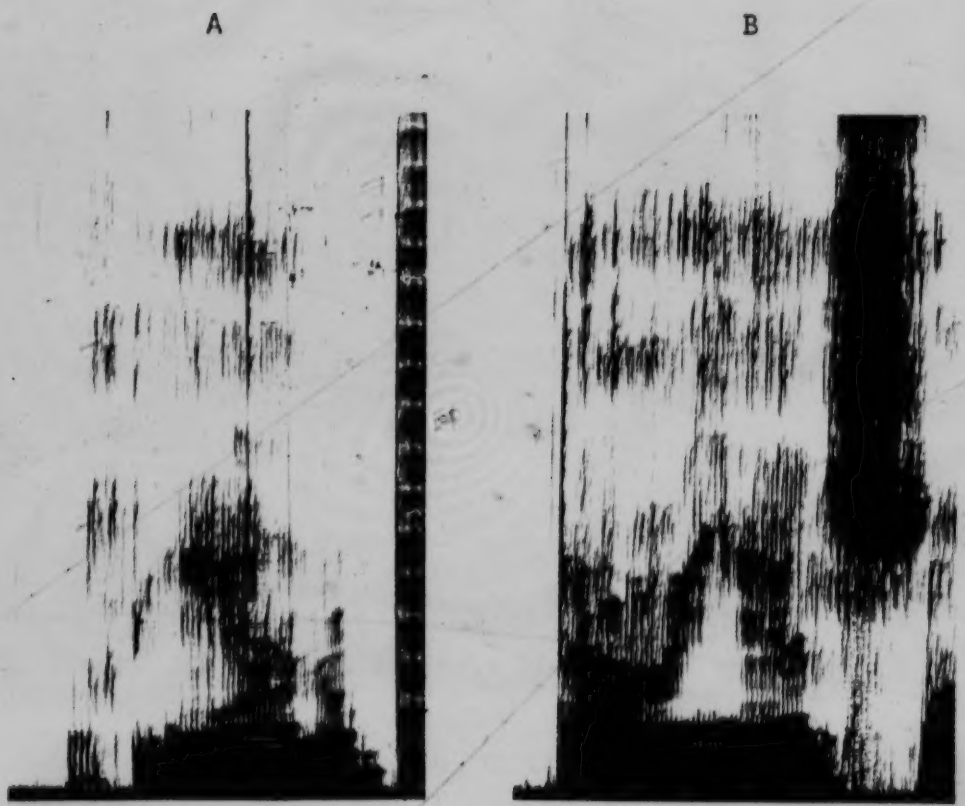
From the readings in Figure 1 it would seem that the obvious distinction between the first (phrase-initial) and the second (phrase-internal) [rjɛ̃] is duration; both are fricated but the initial [rj] sequence is much longer than the internal [rj] sequence. (The degree of friction may play some role in the strengthening of [r] but it does not seem to constitute a distinctive difference between an initial [rj] pronunciation and an initial [r]V pronunciation.) However, the most important difference between phrase-initial [rjɛ̃] (A) and phrase-internal [rjɛ̃] (B) lies in the voicing of [r]; the [r] in A is devoiced compared with the [r] in B.

In Figure 2 the [r] in phrase-initial [rɪjɛ̃] (A) is clearly more voiced than the [r] in 1A. This difference between [r] in 1A and [r] in 2A can be expressed in terms of a difference in strength. The phrase-initial devoicing of [r] followed by [j] indicates a strengthening of [r], since the absence versus presence of voicing in general indicates relative strength versus relative weakness. For example, Delattre's results reveal that the voiceless stops have a considerably higher force of articulation than the voiced stops, as do [f,s,ʃ] in relation to [v,z,ʒ] (cf. above page 25). Thus the occurrence of an initial [rj] sequence can be accounted for by the presence of an [r] which is reinforced to make it stronger than [j].

It should be noted that [rjɛ̃] occurs in phrase-initial position only three times (two of which contain a slight but clearly perceptible [ɪ] colouring) in nine samples, while it

FIGURE 1

Spectrographic examples of [rjɛ̃].

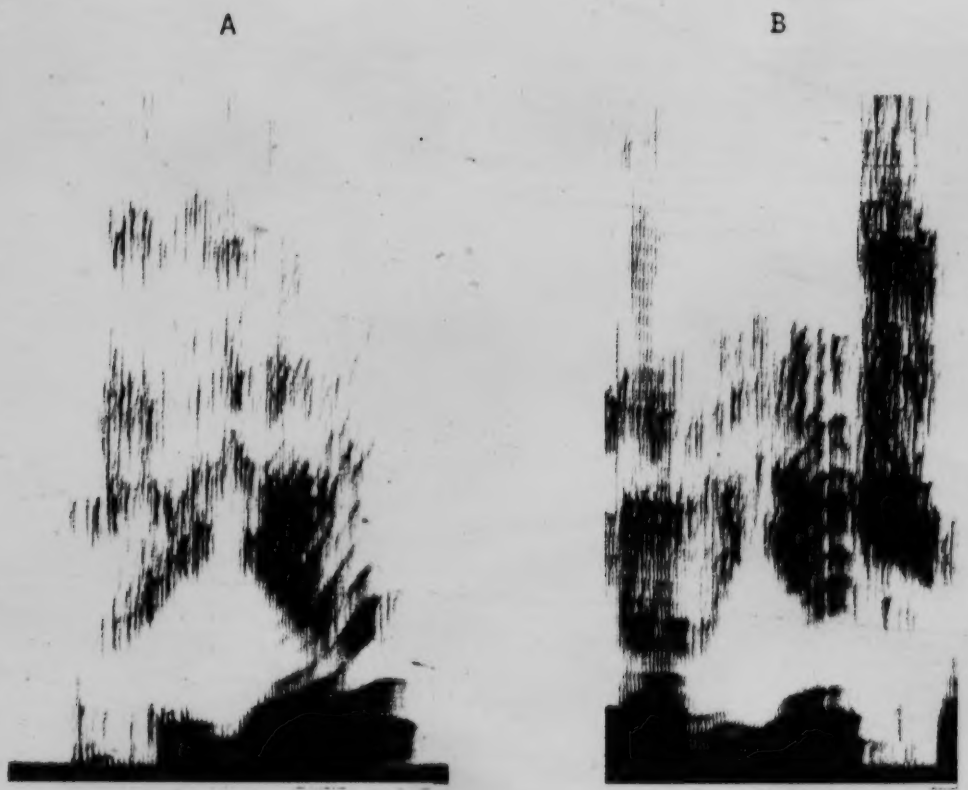


A. Phrase-initial rien. B. Phrase-internal rien.

These readings are taken from the same spectrogram and represent the pronunciation of a young, university-educated male from the Auvergne (Allier Vichy).

FIGURE 2

Spectrographic examples of [rijɛ̃].



A. Phrase-initial rien. B. Phrase-internal rien.

These readings are taken from the same spectrogram and represent the pronunciation of a young, university-educated female from Paris (Rueil).

occurs eight times out of nine in phrase-internal position. This represents strong evidence for the positioning of [r] below [j] on a relational hierarchy of consonantal strength for French.

Therefore, there seems to be no doubt that [r] is weaker than [j] and that exceptional sequences of $[rj] require reinforcement of the [r] to enable them to overcome the strength constraint which would otherwise prevent their occurrence.

The application of the *OL[j] constraint to *O[lj] sequences presents a problem for the sonority hypothesis because the proposed strength hierarchy permits O[lj] to occur. The following examples clearly indicate that *O[lj] does not generally occur in French: bouclier [bukllje], client [klljã], oublier [ublije], peuplier [pœplije], plier [plije], publier [pyblije], sablier [sablije], sanglier [sãglije], tablier [tablije]. Thus it appears initially that the sonority hypothesis cannot account for the constraint on *O[lj]. However, rejection of the hypothesis at this point would be premature; further investigation reveals a number of exceptional occurrences of O[lj] which suggest that the constraint against such *O[lj] sequences is not based on the same criteria as that against *O[rj] (to which no exceptions have been reported). Gaatone (1976:331) allows one class of exceptions in verb forms in some unspecified dialects of French. His source for this is Bell (1972) who allows an optional O[lje] pronunciation for words such as boucliez where the i is not part of the stem but part of the ending. This optional pronunciation may not occur in

verbs such as oublier where the i belongs to the stem rather than the ending.[9] Boucliez, the second person plural imperfect of boucler, may therefore be pronounced [buk|je] or [buk||je]. The optional O[|j] pronunciation can be seen as a morphologically conditioned variation following the normal pronunciation of the imperfect second person plural inflection (O)+[j]V, as in vous arriviez [ar|vje]. This class of exceptions is also noted by Lyche (1979:323-4) who allows an optional O[|j] pronunciation for sembliez [sãb|je] 'in certain dialects, amongst which the Parisian dialect.' In order to verify the occurrence of this verb form, the nine informants referred to above were asked to read a dialogue containing vous sembliez. Seven of them pronounced sembliez as [sãb|je]. These informants were chosen with no regard for dialectal variation.

Lyche restricts the occurrence of O[|j] in these verb forms to fast speech ('Allegro'), and although only two Parisians were included in the sample, my results seem to indicate that this is the case for the Parisian dialect. One of these informants, who read carefully, produced the form [sãb||je], while the other, reading quickly, produced a form which was closer to [sãb|je]. For other dialects, however it seems that O[|j] is the normal pronunciation in these verb forms irrespective of the speed of delivery. The informant with the slowest reading speed of the nine in the sample comes from Dijon and pronounced sembliez as [sãb|je].

Lombard (1964:6,12) notes three instances of an O[lj] sequence occurring across a word boundary; [dlj] des milliers d(e) lieux, [klj] chaque lien, and [flj] chef-lieu. The first of these was incorporated into a dialogue which the nine informants referred to above were required to read. One of the nine, a Parisian, reproduced [dlj] exactly as described by Lombard. Although the other two phrases were not included in the experiment and thus were not verified,[10] it is reasonable to expect that they would occur even if infrequently.

Although these examples of O[lj] are accounted for perfectly by the SSC if a syllable boundary is placed before the obstruent ($O[lj]), there remains a question as to why the *OL[j] constraint restricts *O[lj] sequences in general if [l] is stronger than [j] on the relational hierarchy for French consonants. There are at least two possible answers to this question. The first is that exceptional occurrences of O[lj] are in fact occurrences of O[l']; in other words, the [l] is palatalized. This possibility is suggested firstly by the exceptional [sãbl|je] form from Lyche (1979) which is said to occur only in fast speech, and secondly by the production of the rapid speech form [sãbl(j)e] by one of the informants (see above). It could well be that this form contains only a two-consonant sequence [bl'] rather than a three-consonant [blj] sequence. In both cases the speed of the utterance may be such that a palatalized [l] occurs in place of a [lj] sequence. The exceptions to the *O[lj] constraint, and in

particular those found in verb forms, could therefore be seen as consisting of a two-consonant group O[l']. In this case, the *OL[j] constraint no longer applies because we are not dealing with a three-consonant group. This presents no problem for the strength analysis since the two consonants occur in decreasing order of strength.

The second possible answer is suggested by Delattre (1941: 223), who, in his force of articulation values for consonant pairs, notes that OL groups all have a lower force of articulation than the force of articulation value for the obstruent in each pair (except for [gl],[fl],[vr]).[11] For example, [k] has a single consonant force of articulation of 95, but the group [kr] has a force of articulation of 87, and [kl] of 84. Although these figures offer no obvious information about the strength of each consonant within a pair, they seem in general to suggest a dissimilatory weakening process which lowers the force of articulation of one or both of the consonants in each pair. One possible reason for the general restriction on O[lj] sequences, therefore, could be that this weakening process brings the [l] too close to [j] in strength to enable a stable O[lj] sequence to be maintained. Only in sequences (such as <u>des milliers d(e) lieux</u>) where the word boundary maintains a sequence [lj] would the [l] retain enough of its single consonant strength to produce the (optional) [dlj] sequence referred to above.

Delattre's force of articulation figures are not refined enough to show accurately what the presence of another consonant

does to the force of articulation of [l]. Further analysis along the lines of more recent studies (such as Debrock 1977, cf. footnote 5) may confirm postconsonantal weakening of [l].

The foregoing exceptions to the restriction on O[lj] sequences point to a number of factors which might help to resolve the problem for the sonority hypothesis posed by the general non-occurrence of *O[lj]. Apart from the general constraint on syllable structure expressed in the sonority hypothesis, there must clearly be other language-specific constraints which, for example, limit the number and class of segments that may form clusters or sequences. Unlike the constraint on *O[rj] sequences, the constraint on *O[lj] sequences does not appear to be based on straightforward hierarchically-determined strength relations between the segments. The occurrence of syllable-initial O[l] and [lj] sequences in French supports the positioning of [j] below [l] and [l] below O in the scale of consonantal strength. The sonority hypothesis seems to capture the basic relationship between these segments when only two occur in sequence. But when all three are combined, there seems to be one or more factors not directly or obviously linked to the individual strength for each segment which prevents the linking of all three.

It is possible that the combination of consonants into sequences is partially determined by the proximity in strength of the segments which may potentially form a sequence. In other words, if two consonants such as an obstruent and [l] have hypothetical strength values of 1 and 2 respectively, and [j] has a value of 3, these values may be too close together to enable the consonants to form a sequence. If [j] were to have a

strength value of 5, for example, one might expect an O[lj] sequence to occur more frequently. This means that one of the prerequisites for the combination of more than two consonants in sequence would be the requirement that they be far enough apart in strength to avoid strength 'overlapping'. Just as two consonants of the same strength may not occur in a cluster (such as [t] and [k] in French), the articulation of three or more consonants such as [p], [l], and [j] may be restricted because the attempt to produce all three together results in the 'pushing' of one or more of the segments into the same strength value. The result of this push would be an overlapping of strength values which is not permitted by the sonority hypothesis.[12]

The preceding solutions to the problem posed by the existence of the general constraint on *O[lj] sequences suggest that the application of the sonority hypothesis to specific languages is by no means straightforward. However, the validity of the hypothesis is not seriously undermined by this constraint because the strength relations between obstruents and [l] given in the proposed hierarchy are corroborated by the combinatory phenomena seen in other sequences involving O, [l] and [j].

The proposed hierarchy of consonantal strength for French allows a syllable-initial sequence [jr]. Although this sequence does not seem to be noted in phonological studies of standard French it should be allowable if the strength hierarchy represents the general phonological relationships amongst consonants. Rochet (1980) suggests that it does occur, at least in southern dialects of French, in forms such as [revejra] (réveillera)

and [e$fø$jra] (effeuillera). He establishes this syllabification on the basis of the occurrence of the mid-vowels in Southern French which conform without exception to the 'loi de position.' As we saw above (p. 29), the 'loi' states that a higher mid-vowel ([e] in these examples) indicates a free syllable, and a lower mid-vowel ([ɛ]) indicates a checked syllable. Since the two forms cited above both contain a higher mid-vowel, the syllable division must be made following the [e] and preceding the [j]. This then results in a sequence $[jr].

2.2 Conclusions

The problem we have been most concerned with thus far has been the inadequacy of previous attempts to account for the *OL[j] constraint in modern standard French. Using as a base the sonority hypothesis (as defined by Bell and Hooper 1978:11) I have demonstrated how the constraint can be accounted for within the framework of a theory of syllabic phonology, NGP, which is based on this hypothesis.

Within NGP a syllable structure condition (SSC) determines the placement of syllable boundaries principally by means of a relational hierarchy of consonantal strength. The universal hierarchy proposed by Hooper is modified so that [r] is weaker than [j] but still stronger than the other semivowels [ɥ] and [w]. This modification is the key to the explanation of the constraint. It enables the SSC to assign syllable boundaries according to both the syllabification principles embodied in it and the segment sequence distribution phenomena of standard French. These

principles of syllabification are also constrained by other conditions, one of which, the syllable-initial strength conditions, is required to prevent incorrect assignment of syllable boundaries.

Exceptions to the constraint on *OL[j] and violations, or apparent violations, of the SSC and syllable-initial strength condition leave a small number of unresolved points which will require further examination. Amongst these, the question of strength in consonants occurring in clusters and the possibility of establishing a $[jr] sequence in standard French seem to offer interesting possibilities for further research. If independent evidence for the existence of a syllable-initial [jr] sequence could be found, the placement of the [j] above [r] on the strength scale would be supported. In general, however, the proposal offered to account for the *OL[j] constraint on the basis of the sonority hypothesis demonstrates that a theory based on this hypothesis can capture important generalizations in French phonology, in particular with regard to syllable structure and to the problem of the assignment of syllable boundaries.

FOOTNOTES

1 'Natural generative phonology is based in part on transformational generative theory as developed since the mid 1950's but there are a number of fundamental differences between the theories that have far-reaching consequences for phonological grammars. The major difference concerns the abstractness of phonological representations and rules.' (1976:xi)

The first part of the book deals with these differences and describes in detail the various constituent elements of NGP. The second part deals with 'substantive phonological issues' (1976:xiii), and it is this part which is particularly relevant to my study.

2 Vennemann 1972:7: '...My concept of a strength hierarchy is a traditional one...FOLEY bases his strength scale on sound changes and SIGURD his rank orders on clustering behaviour. I base my strength hierarchies on synchronic phonological rules... [T]hese three concepts merge into a single concept of a partly universal, partly language-specific relational hierarchy of segments.'

3 In discussion of the margins of syllables, Bell and Hooper suggest that there is a hierarchy of segment classes 'obstruent - nasal - liquid - glide' (1978:10) which is organized on the basis of increasing affinity with the adjacent vowel; i.e. increasing sonority. Along with this it is suggested that there is an 'order of preference' (1978:11) for the occurrence of segments as syllable nuclei ('syllabic peaks'), i.e. stop-fricative-resonant-vowel, where a stop is least likely, and a vowel most likely, to be a nucleus. Bell and Hooper note that if the order of affinity with the vowel and the order of preference for the occurrence of segments as a $ nucleus are combined, only three categories remain; obstruent - resonant - vowel (1978:11). They go on to remark that even with these three broad categories the sonority scale 'cannot predict universally whether a syllable peak occurs or not for all sequences' (1978:11-12) and that this prediction is even more difficult for segments within each category.

These observations raise questions about the ability of the sonority hypothesis to form the basis of theories of syllabic phonology such as Hooper's N.G.P. Some of these questions are addressed by Bell and Hooper (1978:11-22) but they go beyond the scope of the present study.

4 These six principles are:

(1.) 'Différence d'aperture' (583-4) for which Delattre uses the first 5 degrees of Grammont's aperture scale (Grammont 1933:99).

(2.) 'Différence de force d'articulation' (584-5) determined by Delattre's own analysis (cf. Delattre 1941), and containing 5 degrees.

(3.) 'Loi du moindre effort' (586) according to which Delattre maintains that 'il est plus aisé de séparer les consonnes que de les prononcer ensemble'.

(4.) 'Direction de la suite des mouvements articulatoires' (586). This principle suggests that the pronunciation of two Cs within the same syllable is more likely to occur if the 2nd is pronounced further back in the mouth than the 1st.

(5.) 'Distance des lieux d'articulation' (586-7). The two Cs are more likely to be in the same syllable if their place of articulation is close.

(6.) 'Place des consonnes par rapport à l'accent' (587). If the following vowel is not 'sous l'accent de groupe' the two Cs are more likely to be pronounced together.

The first two of these principles of phonetic syllabification are the main principles which Delattre uses to decide syllabification; the other four are contributing principles which are called upon only when the first two cannot handle a particular case.

5 Cf. Debrock (1977:81) who notes that it has been demonstrated that 'the rise time of the post-consonantal vowel and the decay time of the preconsonantal vowel are inversely proportionate to the force of articulation. It follows that this relation can be considered an acoustic correlate of the force of articulation.'

6 The semivowels [ɥ,w] are not given on this scale since they are not considered during this study. The occurrence of OL[ɥ] and OL[w] sequences syllable-initially (as in pluie, fruit and gloire, croire) suggests that these two sounds should be located below [r] on the strength hierarchy for French. However the situation is more complex than this because OL[ɥ] only occurs before [i] and OL[w] only occurs before [a].

7 A series of short dialogues was given to nine French speakers from various parts of France who were asked to read them in standard French. The dialogues contained a number of words and phrases, the pronunciation of which was of interest for this study.

8 Assuming that the 'loi de position' applies in the pronunciation of these words a syllable boundary must be placed between [r] and [j]; [ɛr$j] meets the requirements of both the SSC and the syllable-initial strength condition, whereas *[ɛ$rj] does not.

A certain number of variant [ɛrij] pronunciations occured in words such as [ʒɛrijatrik] gériatrique, [pɛrijɛk] périèque. Such variations can be attributed to the emphasis placed on these words as a result of either their unusualness or the slow reading speed of the informants who produced the variants.

9 This generalization may not be valid for all the forms of oublier. From recordings of the phrase j'ai oublié exactement où from my informants I found that the two Parisians in the sample gave two different pronunciations of oublié; one gave [ublije] as expected, but the other gave a form [ubl(j)e] which seemed to contain a palatalized [l].

10 Since the experiment was only marginally concerned with these exceptions, and it was felt that it was difficult to incorporate 'chaque lien' and 'chef-lieu' into a natural sounding dialogue, they were left out of the material used for the recordings.

11 Delattre gives a set of force of articulation figures for two-consonant postvocalic sequences obtained in the same way as the figures for single consonant force of articulation. Extracting the OL sequences from the results, one obtains the following figures:

[kr]	87	[vr]	47
[fl]	85	[gr]	46
[kl]	84	[dr]	44
[tr]	76	[bl]	41.5
[pr]	75	[br]	34.5
[gl]	68		

(1941:223)

Although these results indicate the force of articulation of combinations of OL pairs, they offer no obvious and concrete information about the strength of the individual consonants in each pair. It is not possible, for instance, to conclude anything from the fact that [r] is the second element of the pair with the highest force of articulation ([kr]) except that there is a certain degree of combinatory accommodation of the force of articulation of the stronger O ([k]) to that of the weaker L ([r]). Delattre (1941:228-9) explains the exceptional [fl], [vr] force of articulation figures in terms of the difference in aperture (cf. Delattre 1940:584 and footnote 4 above) between the first and second consonant in each group. This difference is at a maximum between stops (both voiced and voiceless) and liquids. However, the difference in aperture is noticeably reduced between fricatives and liquids, thus in the case of [fl] and [vr], an increase in the force of articulation results rather than a decrease.

In order to account for the exceptional position of [gl], in these results, Delattre (1941:229) is forced to offer a special explanation:

'Le seul groupe...dont la place soit difficile à comprendre est le groupe gl qu'on s'attendrait à trouver plus bas avec gr, dr, bl, br. Cela ne semble pas provenir d'une erreur dans les expériences...Il vaut mieux en chercher la cause dans un facteur général que nous appelons: l'affinité articulatoire des deux consonnes, ou la facilité avec laquelle leurs articulations peuvent s'unir, se combiner, s'emboiter, indépendamment de la

différence d'aperture qui n'en est que l'un des éléments. Cette affinité articulatoire est faible dans le cas de g et l (dans l'ordre g-l) ce qui diminue l'effet adoucissant de la différence d'aperture.'

12 The articulatory characteristics of adjacent segments may also affect their combinability. As I have already suggested (cf. page 36), the force of articulation may be altered when segments occur in sequence. In addition to force of articulation, the place and manner of articulation of segments may also play a role in limiting their combinability. For instance, if their frequency of occurrence is any indication, a consonant pair such as [pl] or [lj] presents few articulatory difficulties. However, the addition of a third consonant such as [j] to [pl] or [p] to [lj] perhaps complicates the articulatory process to the point where the resulting sequence is felt to be too complex. The co-articulation of [lj], for example, requires open lips as well as two different tongue positions (the tip for [l], and the blade for [j]); the addition of [p] requires the lips to be closed initially. This lip closure adds to the muscular effort demanded in the co-articulation of the resultant three-segment sequence [plj]. Thus, a [plj]V sequence is replaced by one such as [pl(j)]V, the articulation of which does not demand the concentrated effort from the articulatory apparatus that is required for the [plj] sequence.

CHAPTER THREE

3.1 Introduction

Although the *OL[j] constraint now applies to standard French, this has not always been the case. Evidence for the occurrence of OL[j] sequences in the late 15th century is found in the bisyllabic use of tordriez (Patelin, c.1470). This occurs in the following couplet which consists of two eight-syllable lines of verse:

> C'est tres bien dit: vous vous tordriez!
> c'est cela! vous ne vouldrïez
> (vv.289-90,cf. Nyrop 1914:II,127)

In order that tordriez may contain only two syllables, the i must be non-syllabic, unlike the ï in vouldrïez which is clearly syllabic. Further evidence from the 16th century suggests that, for the most part, such sequences remained monosyllabic; for instance, Lanoue [1596] lists the following words in which -ier is monosyllabic: baudrier, cendrier, chevrier, estrier, meurdrier, sucrier, etc. (cf. Thurot 1881:I, 492).[1]

By the end of the 16th century, however, it is clear that bisyllabic (OL)ier endings are starting to appear. Lanoue in fact indicates that encombrier, levrïer, manouvrier, ouvrier contain an optional monosyllabic or bisyllabic ending (cf. Th. I,492). One example of a bisyllabic usage from the late 16th century is bouclier (Jodelle c.1570), and this is followed in the early 17th century by chambrière (Regnier, 1612) and meurtrïer (Corneille, 1637) (cf. Th. I,492-3). Bisyllabic (OL)ier endings are common by the second half of the 17th century despite protests by the Académie Française[1638] (cf. Th. I,492; Nyrop 1914: I,74).

Although this change from monosyllabic to bisyllabic -ier is documented from literary works, as the preceding examples show, it is clear from the following comments by Des Marets [1657] that (OL)ier sequences were also pronounced monosyllabically:

> Quelques poëtes de nostre temps se sont avisez, de leur autorité privée, de faire de trois syllabes les mots d'ouvrier, bouclier, sanglier, meurtrier, levrier et quelques autres semblables, pour les rendre de plus facile prononciation; quoyque depuis que l'on parle françois, on ne les ait faits que de deux syllabes. . .Mais ces pöetes n'ont aucun droit, ny aucune autorité suffisante pour établir une loi nouvelle...
>
> (Th.I,493 via Ménage 1672)

The preceding criticisms notwithstanding, bisyllabic usage prevailed; Ménage [1672], disagreeing with Des Marets, comments that 'aujourd'huy cet 'ier' est constamment de deux syllabes' and this insistence on the bisyllabicity of the sequence is reinforced by Lancelot [1660] and Richelet [1680] (cf. Th.I,493-4). By the end of the 17th century the constraint is firmly established.

Proposed explanations for the development of the OL[j] constraint centre on 'difficulty of articulation'. Fouché (1961: 733) states that 'après un groupe consonantique (initial ou intérieur), le y a disparu à cause de la complexité de l'articulation'. He amplifies this by saying 'pendant tout le Moyen Age, les finales -vrier, -plier, etc., ont compté pour une seule syllabe. Mais à un moment donné, la langue semble avoir éprouvé une difficulté à articuler de pareils groupes' (1961:748). Other modern scholars who offer a similar account of the emergence of the constraint are Thurot 1881:I,287; Tobler 1885[1972]:85; Rosset 1911: 202; Clédat 1931:39. However, as is the case with 'difficulty of

articulation' 'explanations' of the synchronic *OL[j] constraint, these accounts are inadequate because no reason for the difficulty is advanced.

Since the constraint now operates on *OL[j] sequences, whereas previously it did not, one should ask what, if anything, changed in the environment of OL[j] to cause such 'difficulty'.[2]

Bourciez and Bourciez (1967:61) suggest that the reduction of the OL[j] sequence constitutes an exception to the general process of strengthening of [j] between a consonant and [e]:

> Relativement à la prononciation moderne, on doit observer qu'au cours du XVII^e siècle -ier, par vocalisation du yod, est devenu dissyllabique derrière consonne + r, l. Les mots du type ouvrier, tablier se prononcent donc ouvrie, tablie, tandis que l'on continue de faire entendre pwarye, etc. Ce phénomène paraît en rapport avec la consonantisation progressive du yod, qui a pour conséquence une accommodation avec la consonne précédente. Dans un mot comme ouvrier, par exemple, l'r était déjà étroitement uni à v. Quand il a dû s'unir également à un y de nuance plus nettement consonantique, la langue a reculé devant la fusion de trois mouvements articulatoires, et le yod s'est au contraire vocalisé sous forme d'i.

This passage suggests that there were two forces opposing each other; the tendency for a (counter-tonic) [i] in hiatus with a following lower (tonic) vowel to consonantize (cf. Pope 1934: 109) versus the complexity of articulation of a three-consonant group of the type OL[j]. Bourciez and Bourciez maintain that as [i] developed into the consonant [j] as a result of normal phonetic evolution, an OL[j] sequence such as the [vrj] group in ouvrier which was [uvrje] etymologically, must have become too awkward

or too complicated to articulate. Thus the [j] vocalized in this environment, reducing the consonant sequence to [vr]. This seems to imply that some change in the nature of the segments in the sequence prevented OL[j] from continuing to occur. As we have seen, there are many three and four-consonant sequences which occur in French, so there can be little question that the specific characteristics of the three segments in the OL[j] sequence are the relevant factors in this case.

In order to test the proposal suggested by Bourciez and Bourciez for the development of the OL[j] constraint, the pronunciation of [j] in the 16th and 17th centuries will be investigated. Evidence of a diachronic strengthening of [j] would account for the development of the constraint on the basis of the sonority hypothesis. Thus, the previously allowed OL[j]V sequence would no longer be permitted if [j] developed into a stronger segment than the preceding L.

3.2 [j]

In order to determine if there was an increase in the 'strength' of the segment [j], descriptions of its articulation must be examined. The main sources consulted in this investigation are Thurot 1881, Rosset 1911, and Nyrop 1914, (volumes I and II); secondary sources include Clédat 1931, Brunot and Bruneau 1933, Millet 1933, Pope 1934, Fouché 1952, 1959, 1961, and Bourciez and Bourciez 1967.

Although intense interest in the French language is apparent during the 16th and 17th centuries, there appears to be no information on [j] which would indicate a change in its force of articulation. Comments on [j] in the sources show that the grammarians were preoccupied with the question of whether the pronunciation of the graphemes i and y should be syllabic or non-syllabic. They do not give any indication of a change in the articulatory effort necessary to produce [j] during this period. In particular, there is an almost total lack of descriptions of any kind which deal with the pronunciation of [j]; the earliest articulatory description appears to be that of Buffier [1724] (cf. Th.I,284-5), but even this account does not permit a comparison of the articulatory effort required for [j] in the early 18th century with the effort required for its articulation at any other point in the development of the language.

As a consequence of this lack, we have no idea of the strength of [j] in the 16th and 17th centuries relative to that of [j] in the 20th century. If it could be established that there was a difference in tenseness of [j] between the 16th and 20th centuries, a comparison of modern articulatory characteristics of [j] between dialects or languages (as Cazanave 1968 does for French and American English) could be used to support a hypothesis of diachronic weakening or strengthening of [j]. However, we have no proof that [j] was becoming any stronger during the 16th and 17th centuries than it had been previously.

Therefore, one cannot conclude that an increase in the strength of [j] was responsible for its vocalization following obstruent + liquid, or by extension, for the development of the *OL[j] constraint. The articulation of [l] and [r] must now be examined to determine if a change in either or both could have caused the [j] in the OL[j] environment to vocalize, or prevented [l] from becoming non-syllabic in OL- environments.

3.3 [l].

There is no evidence for a diachronic change in the articulatory effort required for [l] in the sources consulted (which are the same as for [j] with the addition of Straka 1968). The main concern of 16th and 17th century grammarians with regard to [l] appears to have been the articulation of [l] 'mouillé', but this has no relevance to an investigation of a change in 'strength' of [l].

To substantiate a claim that a change in the articulation of [l] during the 16th and 17th centuries was partially responsible for the evolution of the *OL[j] constraint, it would be necessary to find evidence of weakening of [l] during this period. However, since such evidence does not appear to exist, no such claim can be made.

3.4 [r].

Data for the investigation of changes in the articulation of [r] during the 16th and 17th centuries is found in Straka 1979

[1965], Martinet 1969[1962] and Wolff 1958, as well as in the sources listed for both [j] and [l]. Examination of these sources reveals evidence of a change in [r] in the period from the latter half of the 15th century to the beginning of the 17th century. This evidence is found largely in a number of comments made by 16th century grammarians on the assibilation of [r]. Alternations between [r] and [z] and vice versa appear to have been common in the 16th century, giving rise to such pronunciations as Pazys for Parys, chaize for chaire, mazy for mary (Palsgrave 1520); courin for couzin, Ieru for Iesu (Bovelles 1533); Masie for Marie, mese for mere (Bèze 1584). All these examples of assibilation (or rhotacism of [z]) are found in Thurot (1881:II,271-3), amongst comments from grammarians beginning with Barcley [1521] and ending with Palliot [1608].

This assibilation of [r] occurs as early as the end of the 15th century, as seen in Villon's use (c.1490) of the rhyme chaise: aise (cf. Straka 1979 [1965]:468, fn. 2; Fouché 1961: 603). According to the 17th century grammarian Godard [1620], this practice had all but disappeared by the time of his writing:

> . Nos Parisiens mettoient autrefois (mais cela ne se fait plus ou c'êt fort rarement et seulemant parmi le menu peuple) une s au lieu d'une r et une r au lieu d'une s.
>
> (Th.II,273; Straka 1979[1965]:487)

In order to determine the significance of this alternation with respect to the articulatory characteristics of [r], one needs to know the precise conditions required to enable this transposition from [r] to [z] or [z] to [r] to occur. Straka(1979

[1965]:470) notes that the articulation of [z] for [r] is made possible by 'l'affaiblissement de l'articulation apicale'. More precisely he states (op. cit.:472) that this process is one of 'affaiblissement du mouvement organique de la pointe de la langue' relative to the apical (apico-alveolar) articulation of [r] which requires 'une contraction toute particulière et précise des muscles, notamment ceux de la pointe'.

This description enables one to conclude that the assibilation of [r] in the 16th century indicates a decrease in the muscular effort required for its articulation, that is, a weakening. The fact that assibilation is attested in all non-initial positions (cf. Rosset 1911:295-6; Straka 1979[1965]:468-9) indicates a general weakening of non-initial [r], a process which results finally in the shifting of the place of articulation from apico-alvedar to (dorso-) velar or 'uvular' (cf. Straka op. cit.: 488-490).

The process of velarization of [r], having commenced some time before the 16th century, was largely completed by the mid-17th century. The chronology of velarization in its later stages can be established by noting the disappearance of assibilation; as [r] weakened further, alternations between [r] and [z] occurred less and less frequently. By the close of the 17th century, it appears that the weaker velar articulation of [r] was generalized in standard French.

3.5 Conclusions.

This diachronic study has revealed two major phonological changes during the 16th and 17th centuries: firstly, OL[j] sequences cease to occur; and secondly, [r] undergoes a change from apical to velar articulation, through a demonstrated weakening in articulatory effort.

The chronology of the weakening of [r] corresponds to the evolution of the *OL[j] constraint. As the articulation of [r] became weaker, the 'difficulty' of articulating OL[j] sequences increased. It appears that as [r] weakened, the [j] became impossible to articulate following an O[r] group.

In terms of the sonority hypothesis this means that [r] weakened to the point where it became weaker than [j] causing the *O[rj] constraint to develop.

The inclusion of*O[lj] sequences in the constraint cannot be accounted for due to the lack of evidence for [j] and [l]. However, the hypothesis advanced by Bourciez and Bourciez (1967: 61) remains a possibility; that is, [j] may have strengthened to the point where it made the OL[j] sequence unstable. A possible indication of such strengthening is suggested by the reference to 'rudesse' in the monosyllabic pronunciation of OL<u>ier</u> endings in the second half of the 17th century, noted by both Lancelot[1660] and Richelet[1680] (cf. Th. II, 493-4). Both grammarians give examples such as <u>sanglier</u>, <u>baudrier</u>, <u>ouvrier</u>, <u>peuplier</u>, <u>devriez</u>,

<u>voudriez</u>, which demonstrate that the 'rudesse' of the monosyllable occurs in both O[lj] and O[rj] sequences. Therefore, it is possible that the rough sound in these sequences is caused by a strengthening of both [l] and [r] to compensate for the increased strength of [j]. Without such a hypothetical account of the evolution of the *OL[j] constraint, the application of the constraint to O[lj] sequences makes little sense in terms of the sonority hypothesis.

Another way of accounting for the inclusion of *O[lj] sequences in the constraint would be to hypothesize a general diachronic development in terms of a class of 'liquids'. This would mean that, despite clear articulatory differences between [l] and [r], there is enough similarity between them for [l] to follow the development of [r] in the OL- environment.

It should be remembered that the application of the constraint to *O[lj] sequences is less absolute than its application to *O[rj] sequences, as the occurrence of morphologically-conditioned O[lj] sequences indicates. Therefore, the sonority hypothesis is not invalidated, because it is sufficiently flexible to accommodate inconsistencies, such as the incomplete operation of the *OL[j] constraint, in the application of the strength hierarchy.

FOOTNOTES

1 References to Thurot 1881 will be abbreviated throughout this chapter to (Th. [volume number], [page number]); thus the abbreviated form for the reference given here is (Th. I,492). Dates of grammarians cited by Thurot or other modern scholars are given in square brackets.

2 A search for indications of a possible change reveals that the constraint affected the whole lexicon of French regardless of grammatical class distinctions. Although most of the examples used in the body of this chapter are nouns, many others are verbs as can be seen in particular in Tobler 1885 [1972]: 84-5; Rosset 1911: 203-4; Nyrop 1914: II 40, 127. Thus it appears that a non-morphologically conditioned change in the phonetic or phonological make-up of the OL[j] sequence may have occurred during the 16th and 17th centuries to cause the development of the modern constraint.

CHAPTER FOUR

This study demonstrates that both the synchronic existence and diachronic evolution of the *OL[j] constraint in French can be accounted for on the basis of the sonority hypothesis.

The analysis of *O[rj] presents no complications. Since no occurrences of O[rj] sequences have been found in the course of the preceding study, one can conclude that the position of [r] below [j] on a relational hierarchy of consonantal strength supports an analysis of the *OL[j] constraint using the sonority hypothesis. This conclusion is reinforced by the diachronic weakening of [r] which took place concurrently with the emergence of the constraint during the 16th and 17th centuries. Further confirmation is provided by the general lack of syllable-initial [rj] sequences.

However, the *O[lj] constraint cannot be accounted for in such a satisfactory manner. Synchronically, it appears that [l] is stronger than [j], as the force of articulation data and the occurrence of syllable-initial [lj] sequences tend to confirm. Thus, a sequence $O + [l] + [j] should be possible. Diachronically, no case can be made for a weakening of [l] because of the lack of information on its articulation during the period in which the constraint evolved.

Nevertheless, the sonority hypothesis approach to the *OL[j] constraint is not invalidated, despite the fact that a straight forward strength analysis such as that proposed for *O[rj] does not present itself for *O[lj]. In the first place,

the single consonant force of articulation data gives no indication of the effect of combination on the strength of consonants. Even if $O[|] and /$|j/ sequences occur according to a particular relational hierarchy of consonantal strength, this occurrence does not constitute a guarantee that $O[|j] sequences will also occur. Force of articulation data for consonant pairs in French in fact suggest that adjustments in strength take place when consonants occur in combination.

In the second place, the sonority hypothesis is formulated in such a way as to enable exceptions to the general relational hierarchy of segments to be accounted for on non-phonological grounds if the need arises. Thus, although it only appears to be possible to account for exceptional examples of O[|j] sequences in French on morphological grounds, this in itself does not threaten the viability of the hypothesis.

Therefore, it seems that there is ample justification for the further investigation of the sonority hypothesis. As the foregoing analysis of the *OL[j] constraint demonstrates, a great deal of potential for further study lies in attempting to establish or refine relational hierarchies of sonority or strength for specific languages. The results of this kind of study could then be used to evaluate the usefulness of a theory such as NGP.

In the case of the *OL[j] constraint, further consideration should be given to finding a way to determine the articulatory effects of combination on the strength of the individual segments in a sequence such as O[l]. The possibility of palatalization of [l] in the *O[lj] environment also requires further investigation. In addition, investigation of the influence of factors such as rate of speech, morphological structure, and dialectal variation in the application of the constraint could reveal information useful not only to theoretical phonology, but also to the fields of morphology, syntax, dialectology and applied linguistics.

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